Residential, TG-2000, and Commercial MagStop® Clutch/Brake

Installation & Operation

P-1177
819-0457

Warner Electric

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This guide applies to Warner Electric MagStop® clutches and clutch/brakes used on power equipment.

Residential, TG-2000, and Commercial MagStops are available in a range of torque capacities. The MagStop® name comes from the permanent magnet brake (magnetic stopping) rather than conventional spring activated mechanical brakes. In addition to these general procedures, any applicable OEM general and safety procedures must also be followed.

⚠WARNING Failure to follow these instructions may result in product damage, equipment damage, and serious or fatal injury to personnel.

MagStop® Bearing Mounted Electric Clutch and Clutch/Brake Assemblies and Operation

Components: (See Figure 1 on page 5.)

1. **Rotor Assembly**
   Generally, the input of the clutch. Includes a keyed hub which mates with the keyway in the crank shaft. The rotor transmits the torque from the crankshaft (driving shaft) to the armature assembly (output).

2. **Armature Assembly**
   Generally, the output of the clutch. Consists of a disk, springs and pulley (or output flange). With power applied the armature transmits torque from the rotor to the driven load. Power from the armature disk is transmitted to the pulley or flange by means of the leaf springs.

3. **Field Assembly**
   The clutch "power" source contains the coil which generates magnetic attractive force.

4. **Brake Poles**
   The two permanent magnets and plates affixed to the field shell provide the brake torque when the clutch is disengaged. Brake poles are not present if the assembly is a clutch only.

5. **D-drive Spacer**
   A hub that is inserted into either armature or field bearing (see Figure 2). The head has flats that can be held with a wrench to prevent rotation of the crankshaft when tightening the mounting bolt (see Figure 5). This hub also takes the place of the standard retaining washer.

6. **Anti-rotation Slot**
   Anti-rotation Slot (used with OEM's anti-rotation device) prevents MagStop from rotation with crankshaft. If the field is bolted rigidly or if its axial movement is restricted the bearing in the field assembly will be improperly loaded and may fail. Use OEM supplied anti-rotation.

Optional Washer
A single .250 inch (6.35 mm) minimum thick steel washer must be used between the clutch and the crank shaft retaining bolt if the D-drive spacer is not used.

⚠WARNING A washer less than .250 inch (6.35 mm) thick will deform and allow the clamping load to be lost, resulting in damage to the clutch and/or the crankshaft and possible personal injury due to clutch separating from the shaft. Multiple thinner washers are not acceptable.

MagStop® Components

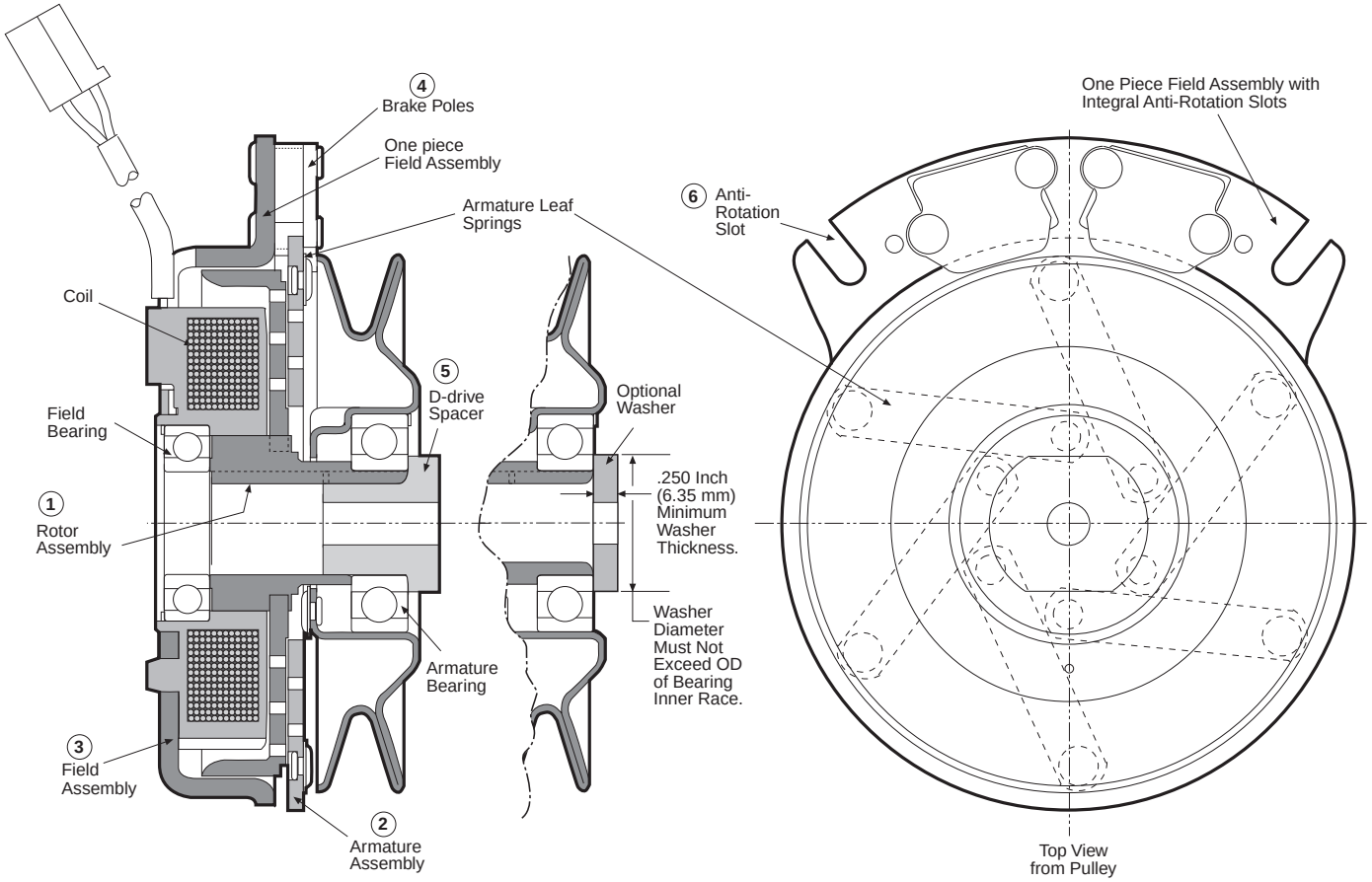
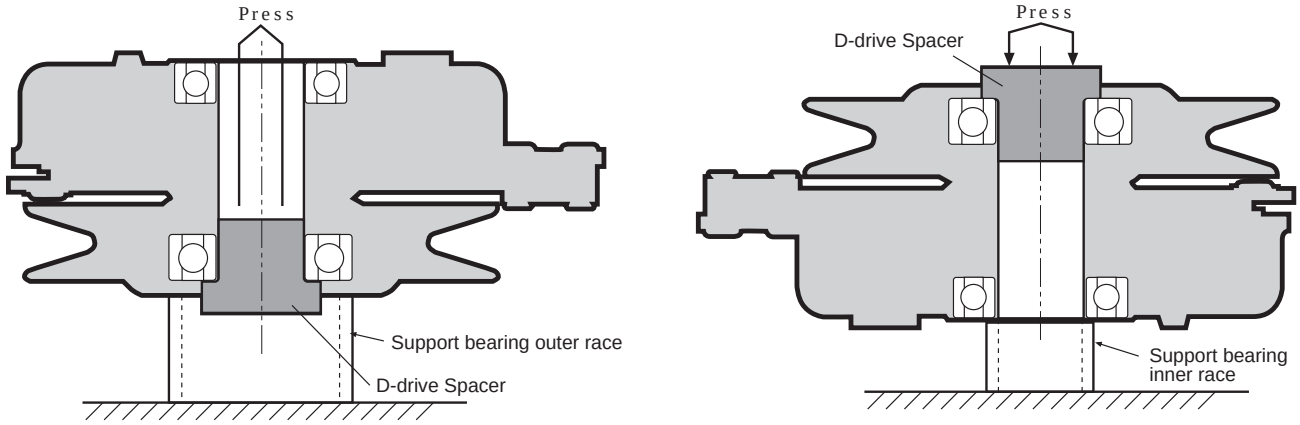


Figure 1

D-drive Spacer Removal/Installation



D-drive Spacer removal

D-drive Spacer installation

Figure 2

D-drive spacer may be installed on either end of clutch by OEM.

⚠CAUTION D-drive spacer must be removed or installed using an arbor press or equivalent. On installation, opposite bearing INNER race must be supported or bearing damage may occur. On removal, adjacent bearing OUTER race must be supported or bearing damage may occur.

REQUIREMENTS
for a
Successful Clutch Application / Installation

Critical Requirements

The two most important requirements for a successful clutch application or installation are:

1. Antirotation device must allow both axial and radial free-play!

Failure to allow this free-play will result in field bearing failure. The greater the restriction the faster the bearing will fail!

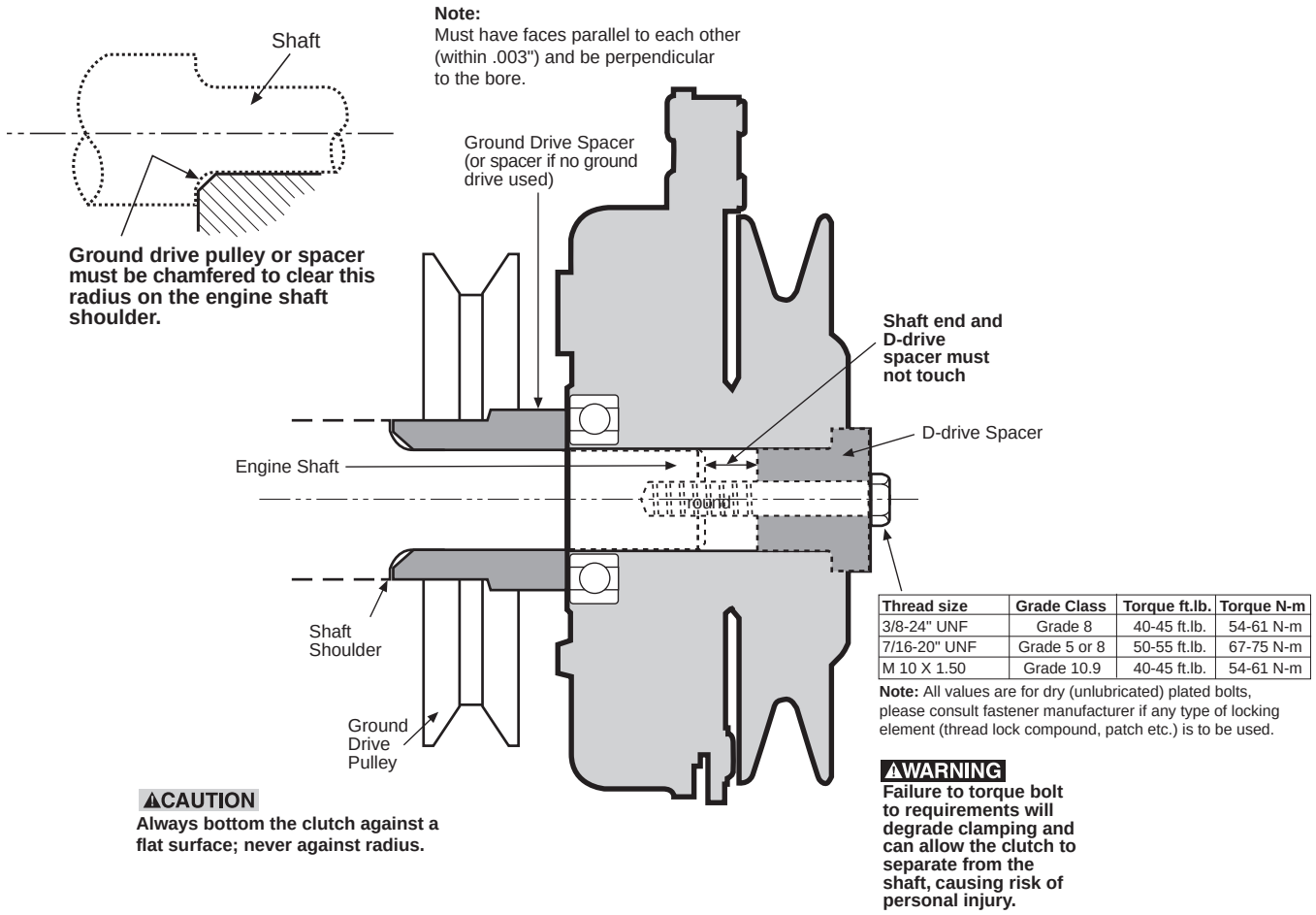
2. Mounting bolt torque to be minimum of:

   - 3/8 -24 UNF use Grade 8 bolt torqued to 40-45 lb.-ft. **(Grade 5 bolt is unacceptable)**
   - 7/16-20 UNF Grade 5 or 8 bolt torqued to 50-55 lb.-ft. **(Grade 5 or 8 bolt is acceptable)**
   - M 10 X 1.50 Class 10.9 torqued to 55-60 N-m

   Note: All values are for dry (unlubricated) plated bolts, please consult fastener manufacturer if any type of locking element (thread lock compound, patch etc.) is to be used.

Failure to adhere to these requirements will result in the failure of the clutch!

Mounting


Shaft
Ground drive pulley or spacer must be chamfered to clear this radius on the engine shaft shoulder.
Note:
Must have faces parallel to each other (within .003") and be perpendicular to the bore.
Ground Drive Spacer (or spacer if no ground drive used)
Shaft end and D-drive spacer must not touch
D-drive Spacer
Engine Shaft
Shaft Shoulder
Ground Drive Pulley
⚠CAUTION
Always bottom the clutch against a flat surface; never against radius.
⚠WARNING
Failure to torque bolt to requirements will degrade clamping and can allow the clutch to separate from the shaft, causing risk of personal injury.

Thread size	Grade Class	Torque ft.lb.	Torque N-m
3/8-24" UNF	Grade 8	40-45 ft.lb.	54-61 N-m
7/16-20" UNF	Grade 5 or 8	50-55 ft.lb.	67-75 N-m
M 10 X 1.50	Grade 10.9	40-45 ft.lb.	54-61 N-m

Note: All values are for dry (unlubricated) plated bolts, please consult fastener manufacturer if any type of locking element (thread lock compound, patch etc.) is to be used.

Figure 3
Typical Engine Installation with Ground Drive Pulley

Anti-Rotation

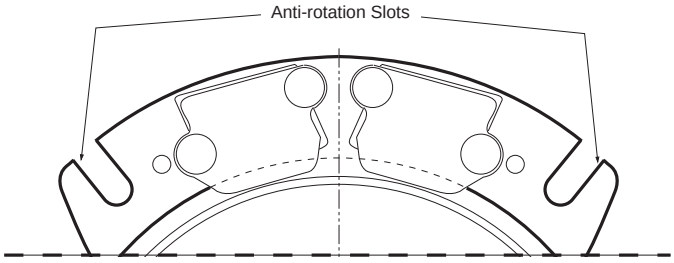
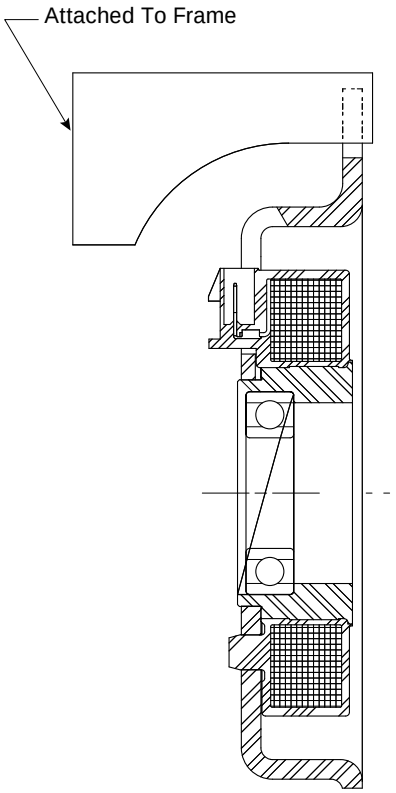


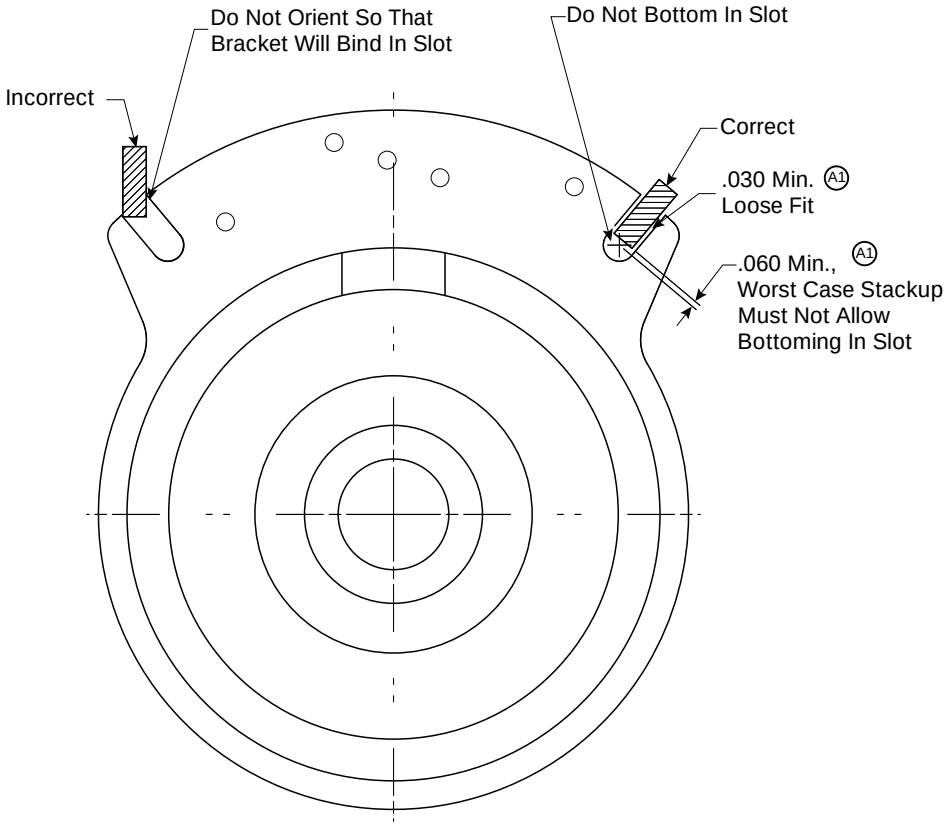
Figure 4

See Anti-Roatation Examples on pages 8-14

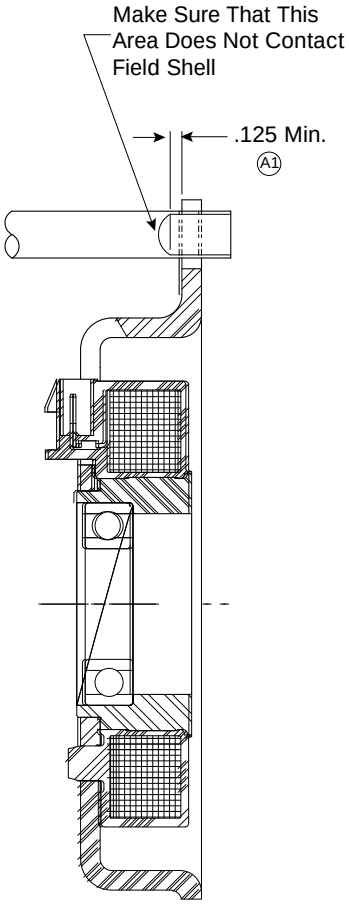
⚠CAUTION If the field is bolted rigidly or if its axial movement is restricted, the bearing in the field assembly will be improperly loaded and may fail. Use only factory installed anti-rotation device.

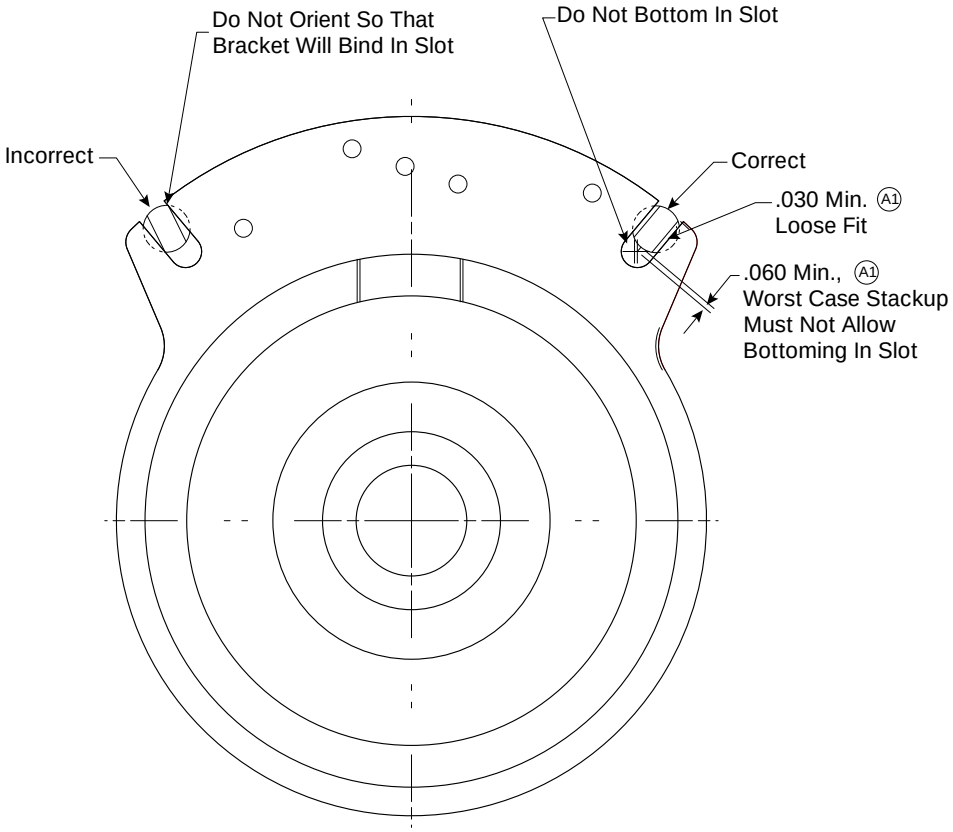
Anti-Rotation Example



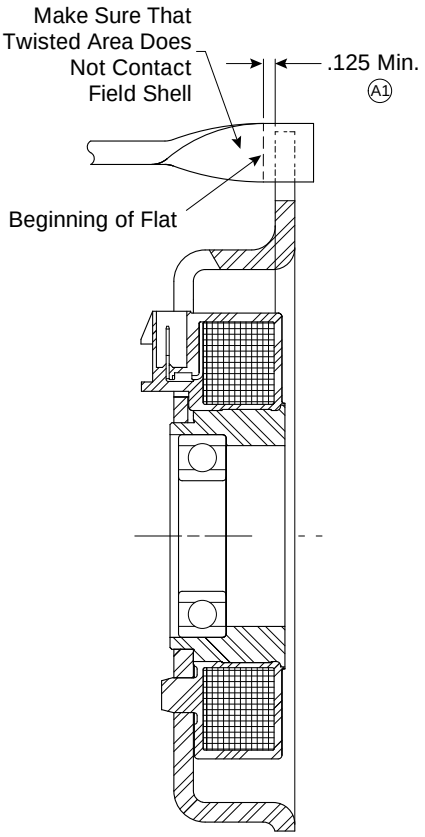


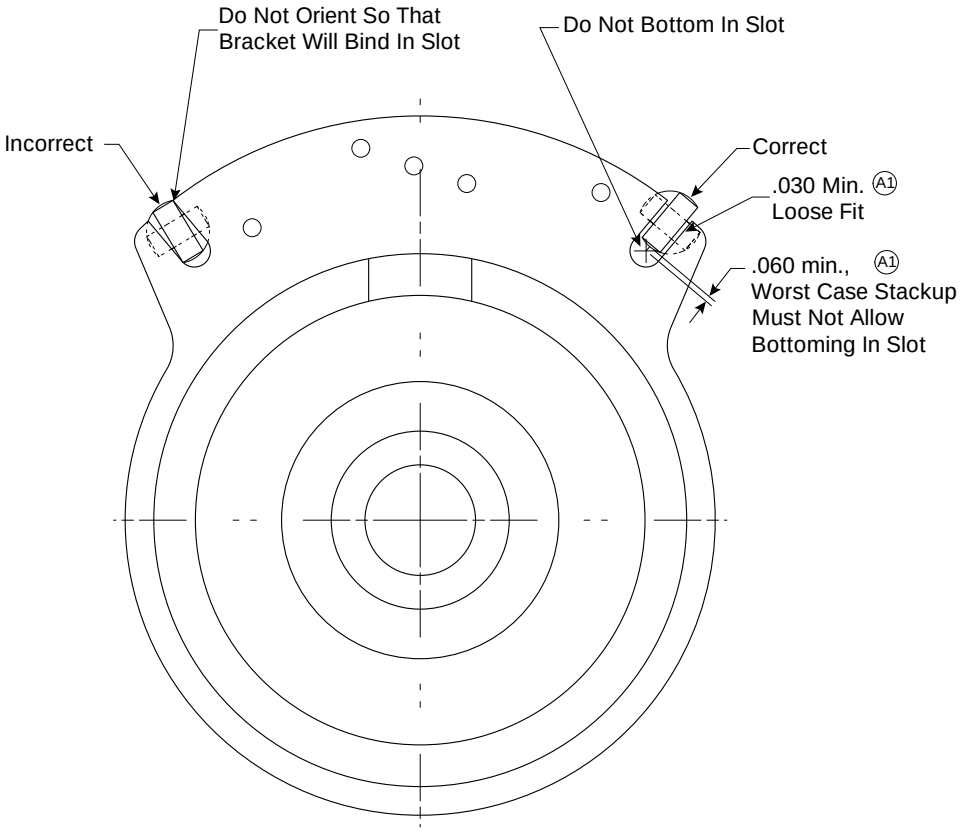
Anti-Rotation Example



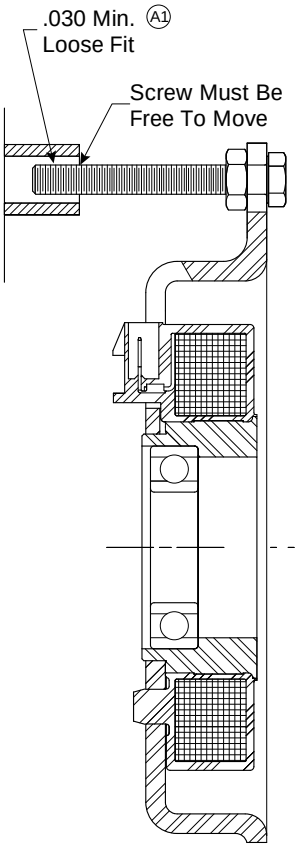


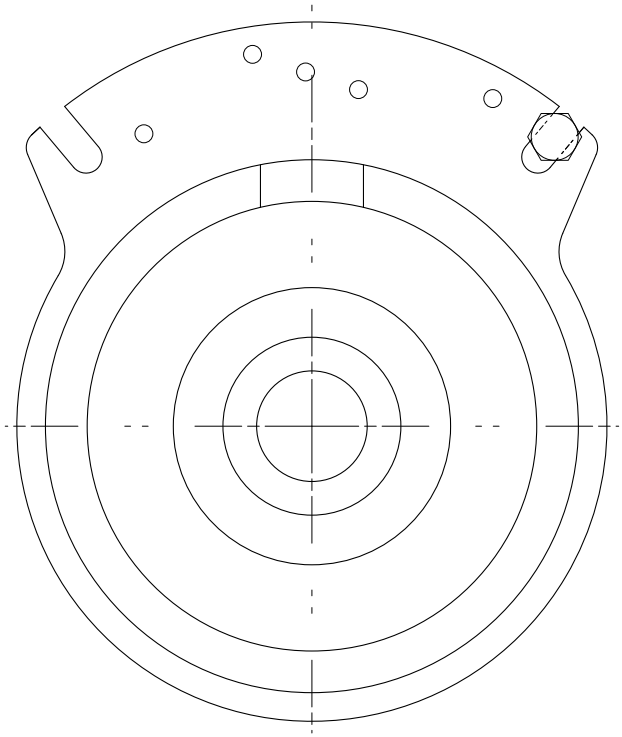
Anti-Rotation Example



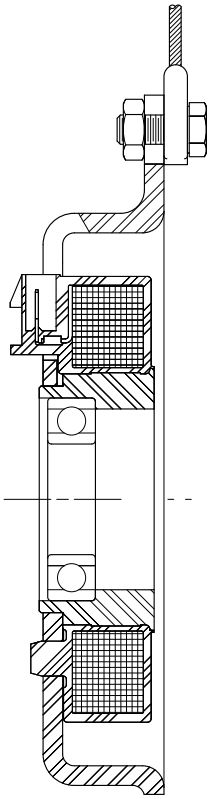


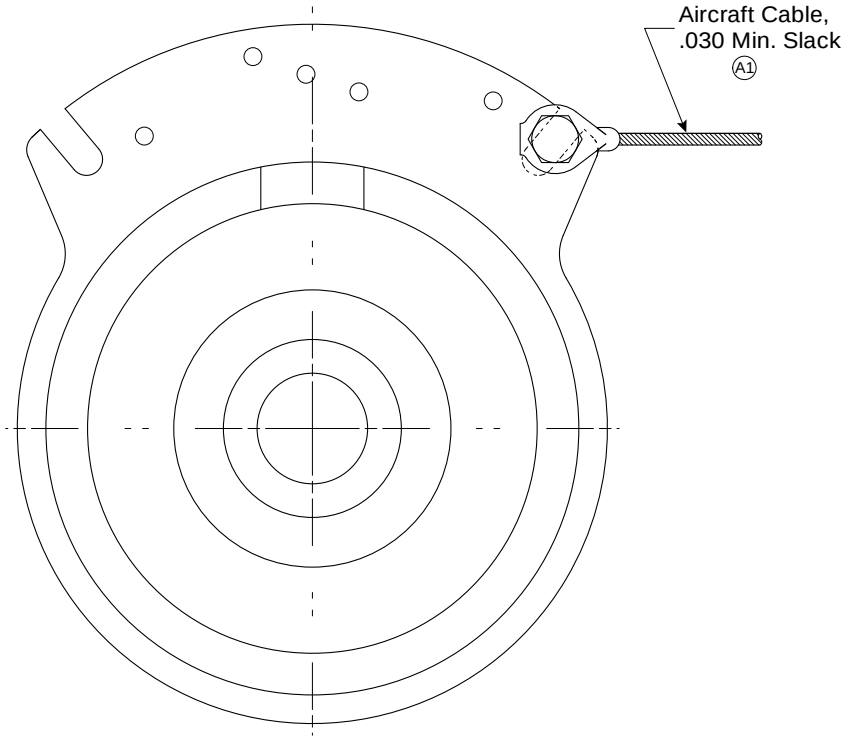
Anti-Rotation Example



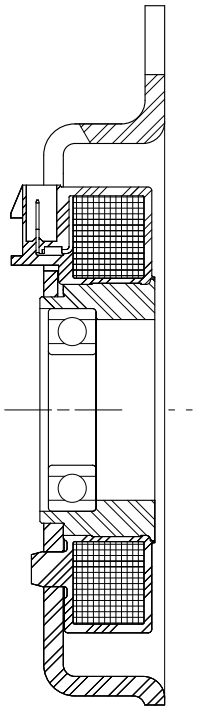


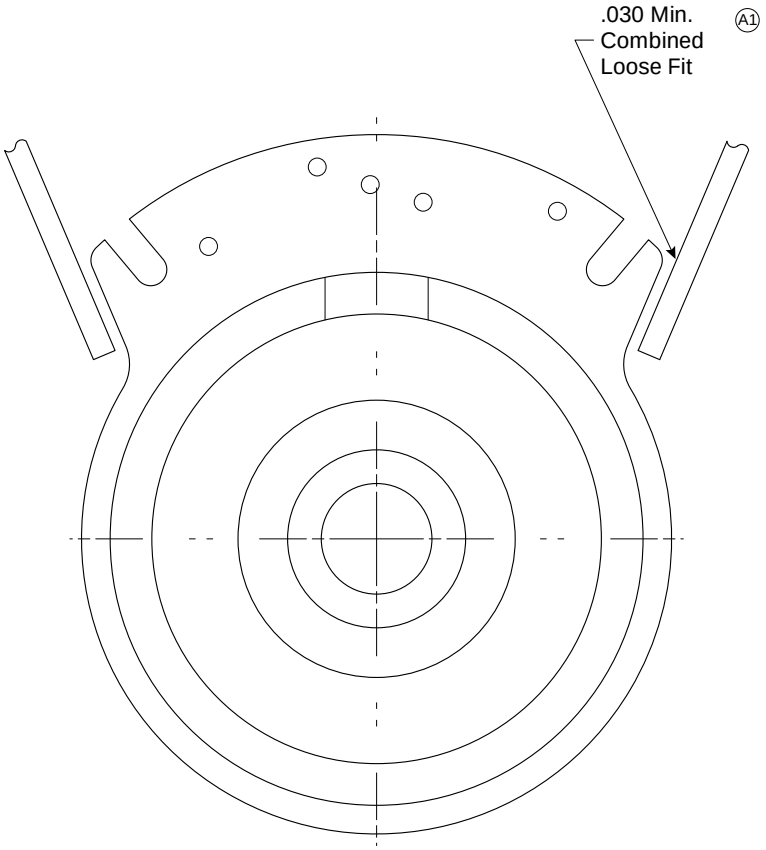
Anti-Rotation Example



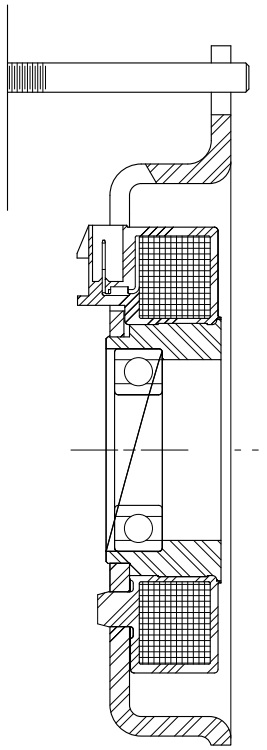


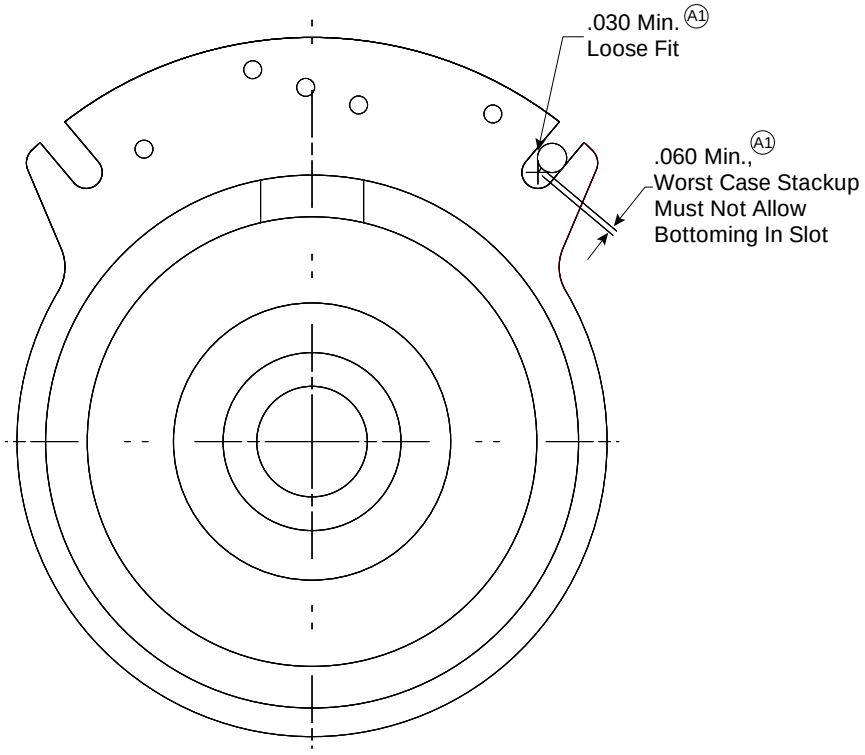
Anti-Rotation Example





Anti-Rotation Example





Troubleshooting Checklist

A. Symptom: Clutch will not engage

Problem	Possible Causes	Solution
Blown fuse	• Low coil resistance • Defective battery • Faulty charging system • Bad wiring or connections, PTO switch	• Replace with new MagStop unit • Replace • Repair or replace • Repair or replace
Low voltage supply (Less than 12 VDC at clutch)	• Defective battery • Faulty charging system • Bad wiring or connectors, PTO switch	• Replace • Repair or replace • Repair or replace
Incorrect coil resistance (see Step 1, page 17)	• Damaged coil	• Replace with new MagStop unit
Inadequate current supply	• Broken clutch lead wire • Faulty electrical system	• Repair • Measure clutch coil resistance and supply voltage at the clutch. If both are correct, electrical system is faulty. Repair or replace.
Rotor/armature airgap too large (greater than .125 inch/3.18mm)	• Rotor/armature wear. End of usable life	• Replace with new MagStop unit

B. Symptom: Brake will not engage

Problem	Possible Causes	Solution
Armature/brake poles wore out	• End of usable life	• Replace with new MagStop unit
Contaminated friction surfaces	• Engine oil leak on brake	• Repair leak • Replace with new MagStop unit

C. Symptom: Clutch slip

Problem	Possible Causes	Solution
Low voltage supply (less than 12 VDC at clutch)	• Defective battery • Faulty charging system • Bad wiring or connectors, PTO switch	• Replace • Repair or replace • Repair
Inadequate current supply	• Broken clutch lead wire • Faulty electrical system	• Repair • Measure clutch coil resistance and supply voltage at the clutch. If both are correct, electrical system is faulty. Repair or replace.
Overloaded clutch	• Clogged deck, back spindle, etc.	• Remove excess grass • Replace spindle
Contaminated friction surfaces	• Engine oil leak on clutch	• Repair leak • Replace with new MagStop unit

Troubleshooting Checklist (Continued)

D. Symptom: Noisy clutch/Vibration

Problem	Possible Causes	Solution
Failed bearing	• Loose mounting (bolt not torqued properly) • Field assembly movement restricted	• Replace (see Mounting Figure 3, page 7) • Confirm proper Anti-rotation (see Anti-rotation, Figure 4, page 7)
Adapter plate rattles against anti-rotation pin	• Some noise is normal	• If noise is excessive, repair or replace anti-rotation device. (Follow OEM's Specifications. See Anti-rotation, Figure 4, page 7).
Clutch loose on shaft	• Loose mounting (bolt not torqued properly) • Mounting bolt too long and bottoms in engine shaft before clamping clutch • Mounting washer too thin and deforms when bolt is tightened. • Shaft bottoms on D-drive	• Tighten mounting bolt to specification. See Mounting, Figure 3. page 7. • Use correct length bolt (see Mounting page 7, Figure 3) • See Figure 1 and Warning on page 5. • Use proper spacer (see Mounting page 7)
Clutch not mounted square	• Ground Drive Spacer mounting shoulder not squared. See Mounting Figure 3. • Clutch integral key hitting end of keyway in engine shaft • Incorrect or no chamfer on ground drive spacer.	• Replace • Space clutch away from radius in shaft keyway. • Increase chamfer on ground drive spacer. See Caution, Figure 3, page 7.
Broken Spring	• Loose mounting	• Replace clutch

⚠WARNING A clutch with broken rivets or springs may separate from the shaft and cause personal injury.

Burnishing Procedure when installing a new MagStop® Clutch/Brake

This procedure should be performed with the load attached (mowing deck, snowblower, pump etc.)

Note: Do NOT add additional load (e.g. cutting grass).

1. Run engine at full throttle and engage load bringing load to full speed then disengage load.

2. Let load come to a full stop then engage again.

3. Repeat these procedures (1 and 2) 10 times. After burnish procedure is complete, to maximize deck drive train life, always engage clutch at half throttle.

Electrical Evaluation

Step 1. How to Measure Clutch Coil resistance (See Figure 5)

1. Turn engine and PTO switch off.
2. Disconnect clutch at clutch connector.
3. Select meter setting for ohm reading.
4. Connect meter leads to clutch.
5. Check meter reading and refer to the chart below for correct clutch resistance reading. (values are @ 68°F.)

   If reading falls in acceptable range proceed to step 2, if not replace the clutch.

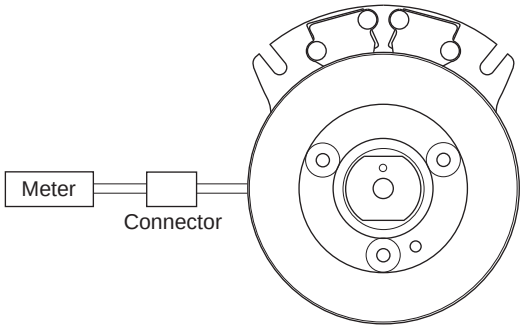


Figure 5
Resistance Measurement

Table 1

Model	Torque (ft.-lb.) Nom.	Nm	Resistance at 70˚ F (ohms) ±5%
MS-60	60	81	7.18
MS-80	80	108	3.68
TG2K-125	125	169	2.84
CMS-150	150	203	2.47
CMS-175	175	237	2.30
CMS-200	200	271	1.84

Note: If bench tested with 12 volts applied, armature may not pull away from brakepoles. Rotational motion is required to engage clutch.

Step 2. Measure the supply voltage at the clutch (See Figure 6)

1. Turn engine off.
2. Connect meter leads at the clutch connector.
3. Select meter setting for voltage reading.
4. Make sure wires will not become entangled in rotating components of clutch.
5. Start engine and engage PTO switch.
6. Measure voltage across the leads at the connectors.
7. Voltage should be 12-14 volts DC. If clutch still fails to operate, replace clutch.
8. If voltage is not within 12-14 volt range consult EOM's service manual.

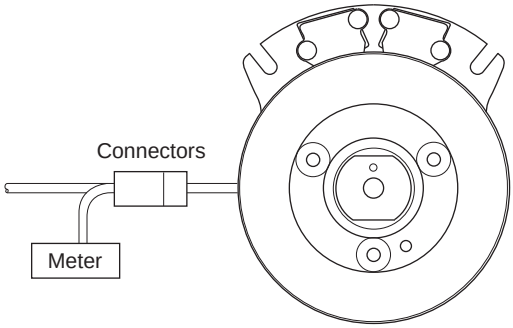


Figure 6
Voltage Measurement

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